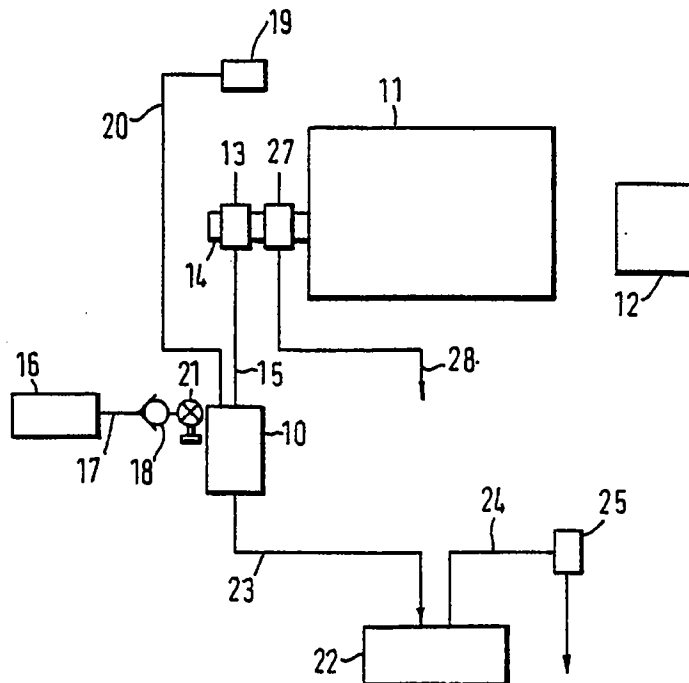


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**(54) Title: APPARATUS FOR SUPPLYING A PRE-DETERMINED VOLUME OF WATER FOR BEVERAGE BREWING APPARATUS**



**(57) Abstract**

Apparatus for supplying a pre-determined volume of water for a beverage brewer (22) comprises a container (10) which is supplied with hot water from a tank (11) for a period of time determined by control means (12). A compressor (16) is operable to expel the water from the container (10) by means of compressed air. The apparatus can be adapted to supply different volumes of water by variation of the said period of time.

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APPARATUS FOR SUPPLYING A  
PRE-DETERMINED VOLUME OF WATER  
FOR BEVERAGE BREWING APPARATUS

This invention relates to apparatus of the type, hereinafter referred to as the type specified, for delivering a volume of hot water under pressure to a beverage brewer in which the water is forced by the pressure through a quantity of particulate beverage material such as leaf tea or ground coffee. Such apparatus finds particular application in a beverage vending machine.

Apparatus of the type specified is known wherein a measuring vessel is immersed in a hot water tank and is kept entirely filled with water at near boiling point. The whole contents of the vessel is then discharged in each operational cycle to a beverage brewer by means of compressed air, the compressed air following the water through the beverage material in the beverage brewer to dry the material. This system has the disadvantage that to vary the volume of water discharged to the brewer requires the measuring vessel to be changed.

It is also known to deliver hot water to a beverage brewer under gravity and to vary the amount of water delivered to the brewer to vary the strength of the beverage produced by the brewer. In this known arrangement the brewer is of a different type to that mentioned above and it is not necessary to pass the air through the beverage material to dry the same.

It is an object of the invention to provide apparatus of the type specified which has the capability of being operated to deliver different volumes of water

to the brewer to vary the strength of the beverage produced thereby.

The invention provides apparatus of the type specified comprising:

5. a container;

water supply means capable of delivering hot water at a substantially constant rate of flow;

water delivery means for delivering hot water from the supply means to the container;

10 compressed air supply means operable to deliver compressed air to the container;

and control means (1) to operate said water delivery means for a pre-determined period of time so that a pre-determined volume of water is delivered to the  
15 container and (2) to operate the compressed air means to discharge the water from the container at greater than atmospheric pressure to convey the hot water therein from the container to a beverage brewer connected thereto and to force the hot water through beverage  
20 material in the brewer.

Two embodiments of the invention will now be described by way of example with reference to the accompanying drawings in which:-

Figure 1 is a schematic diagram of a first  
25 embodiment of the invention;

Figures 2 and 3 are elevations of an actual machine

having the features shown in Figure 1; and

Figure 4 is a schematic diagram of a second embodiment of the invention.

Referring now to the Figure 1, the apparatus  
5 comprises a container 10, a hot water supply tank 11 and control means 12. The tank has means, not shown, for maintaining a constant head of water therein so that water may be delivered from the tank at a substantially constant rate of flow. A valve 13 controls the passage  
10 of water under gravity from the hot water tank 11 to the container 10 through a conduit 15. A compressor 16 enables compressed air to be passed into the container 10 through a conduit 17 having a non-return valve 18 and a pressure regulator 21. A vent valve 19 in a vent conduit  
15 20 enables the air displaced from the container 10 by the entry of the water down the conduit 15 to be vented to the atmosphere. The valves 13 and 19 and the compressor 16 are all operable on command of the control means by means, for example, of solenoids or cams (not shown).

20 After a customer has selected a desired beverage by means of a control panel (not shown) associated with the control means the hot water valve 13 opens so that hot water flows by gravity into the container through the conduit 15. After a specific period of time  
25 determined by the control means 12 in response to the selection made by the customer, the valve 13 closes by which time a pre-determined volume of hot water has been transferred into the container 10, the volume being determined by the period that the valve 13 is open.

30 The vent valve 19 is open while the container 10 is being supplied water so that steam is also vented to the

atmosphere.

When the required volume of water has been delivered to the container 10, the valve 13 and the vent valve 19 are closed by the control means and the compressor 16 is then operated to introduce compressed air into the container which causes the water in the container to be forced by the compressed air through the conduit 23 into the beverage brewer 22 where it flows through the selected particulate beverage material (not shown) at above atmospheric pressure to produce the beverage. The air follows the beverage from the brewer and forces the beverage through a conduit 24 to a blow off chamber 25 where steam and compressed air are separated off. The beverage passes through a conduit 26 to a cup filling station (not shown in Figure 1) or to a part of the machine where further ingredients are added.

The volume of water delivered to the container 10 may be required to be varied. Thus if the brewer produces coffee it may be desired to produce two strengths of coffee, very strong, so called "Mocca", and of normal strength. In such case when Mocca is selected by operation of the control means a smaller volume of water will be delivered to the container than when normal strength coffee is required. For Mocca therefore the valve 13 will be open for a shorter period than if normal strength coffee is required. This variation in timing may be effected by two cams which open the valve 13 for different times or by microprocessor control.

The hot water tank 11 may also have one or more extra outlet valves, such as that shown at 27, so that hot water can be supplied through a conduit such as 28 for making beverages such as chocolate which do not

require brewing with the use of compressed air.

Referring now to Figures 2 and 3 these show parts of a vending machine for beverages which includes the apparatus shown schematically in Figure 1.

5 Referring to Figures 2 and 3, the machine comprises a housing 30 in which the various parts are located. It will be seen from Figure 3 that the hot water tank is at the top of the machine and the container 10 is located below the water tank. Thus hot water flows from the tank  
10 11 through the valve 13 down the conduit 15 into the container 10 and from thence via the conduit 23 to the beverage brewer 22 shown in Figure 2. The view in Figure 2 is of the same machine as Figure 3 but with certain covers 31 and 32 in place which cover the parts shown in  
15 Figure 3.

Referring now to Figure 2, the hot water is delivered from the container 10 along the conduit 23 to the beverage brewer 22 which has a slide 33. With the slide in the position as shown in Figure 2, coffee can be  
20 discharged from a coffee container 34 by means of a screw 35 into a brewing chamber not shown. The slide 33 then moves to the left to close the brewing chamber after which the hot water is delivered along the conduit 23 and is forced through the coffee in the chamber up the  
25 conduit 24 to the blast-off chamber 25 which as will be seen is towards the top of the housing. The blast-off chamber is vented at 36. The beverage then flows down the conduit 26 to a mixing bowl 37 into which sugar and whitener can be discharged if desired from containers 38  
30 and 39 respectively via screws 40 and 41. The beverage then passes through a whipper 42 to a cup delivery

station 38 from which it is delivered into a cup, not shown.

The compressed air which follows the water along the conduit 23 passes through the beverage material in the brewer to dry it and then the brewer is arranged to tip the dried beverage material into a waste bin 39.

Referring now to Figure 4, this shows a second embodiment of the invention in which there is a water supply tank 50 having a valve 51 which is operated in the same manner as the valve 13 of the embodiment of Figures 1 to 3. In this case hot water which passes the valve 51 passes down a conduit 52 into the inlet of a peristaltic pump 53. The outlet of the peristaltic pump is connected to a conduit 54 which provides a container and this conduit 54 is connected to the brewer unit 55. The brewer unit is of the same description as the brewer unit 22 of Figures 1 to 3. The coffee or other beverage which is delivered from the brewer unit 55 passes down a conduit 56 into a mixing bowl 57 and from thence to a whipper 58 and into a delivery station 59. A vent pipe 60 is connected to the conduit 52 and extends above the level of the water tank 50.

In this arrangement, the valve 51 is held open for the required period of time to allow water to fall by gravity into the peristaltic pump 53 which is operated to deliver the water to the container formed by the conduit 54. After all the water has passed through the pump, air is then drawn in by the pump along the vent 60 and is delivered under pressure into the container 54 to propel the water therein into the brewer 55 and to displace the beverage from the brewer into the conduit 56 and then to the delivery 59 etc.



This embodiment is simpler than that of Figures 1 to 3 and avoids the need for a compressor or a blast-off chamber since the compressed air is at comparatively low pressure. Preferably the diameter of the vent 60 is less than the diameter of the conduit 52.

## CLAIMS

1. Apparatus of the type specified comprising:

a container;

water supply means capable of delivering hot water at a substantially constant rate of flow;

5 water delivery means for delivering hot water from the supply means to the container;

compressed air supply means operable to deliver compressed air to the container;

10 and control means (1) to operate said water delivery means for a pre-determined period of time so that a pre-determined volume of water is delivered to the container and (2) to operate the compressed air means to discharge the water from the container at greater than atmospheric pressure to convey the hot water therein  
15 from the container to a beverage brewer connected thereto and to force the hot water through beverage material in the brewer.

2. Apparatus according to Claim 1 wherein said water supply means comprises a water tank in which hot water  
20 is maintained at a substantially constant head.

3. Apparatus according to Claim 1 or Claim 2 wherein the water delivery means comprises a valve operable for said predetermined period of time on command of said control means to control the flow of water from the  
25 water supply means.

4. Apparatus according to any preceding claim including a vent conduit through which air contained in the chamber can be displaced by the water entering the container, the vent conduit having a vent valve operable on command of  
5 the control means whereby said second conduit may be closed to allow the container to be pressurised by said compressed air supply means.

5. Apparatus according to Claim 4 wherein the compressed air supply means comprises a compressor which  
10 may be connected to the container to pressurise the same.

6. Apparatus according to any of Claims 1 to 3 wherein the water delivery means and the compressed air supply means comprise a common pump arranged first to pump the hot water delivered from the water supply means to the  
15 container and then to pump air under pressure to discharge the water from the container and deliver it to the beverage brewer.

7. Apparatus according to any preceding claim wherein the control means is such that said predetermined period  
20 of time can be varied.

8. Apparatus of the type specified substantially as hereinbefore described with reference to Figures 1 to 3 or Figure 4 of the accompanying drawings.

9. A beverage vending machine including apparatus as  
25 claimed in any preceding claim and a beverage brewer and in which the water is delivered from the container to and through the brewer by air provided by the compressed air supply means.

FIG. 1.

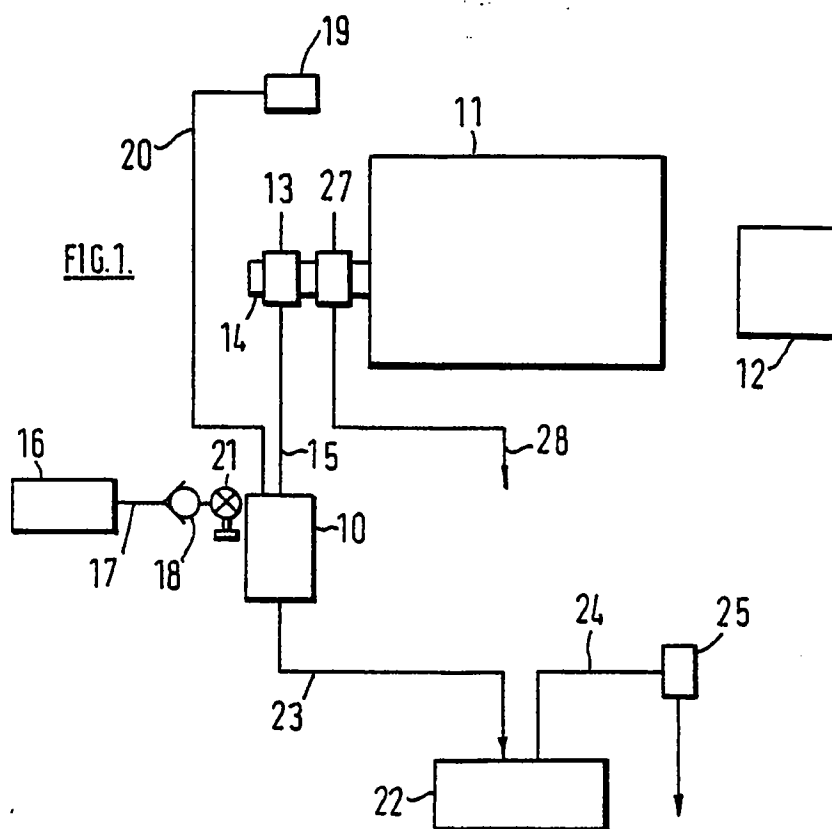
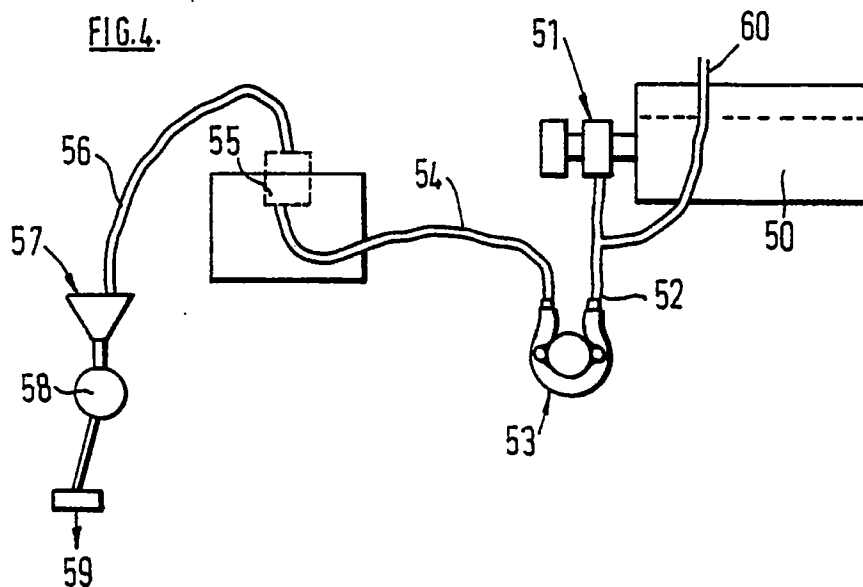


FIG. 4.



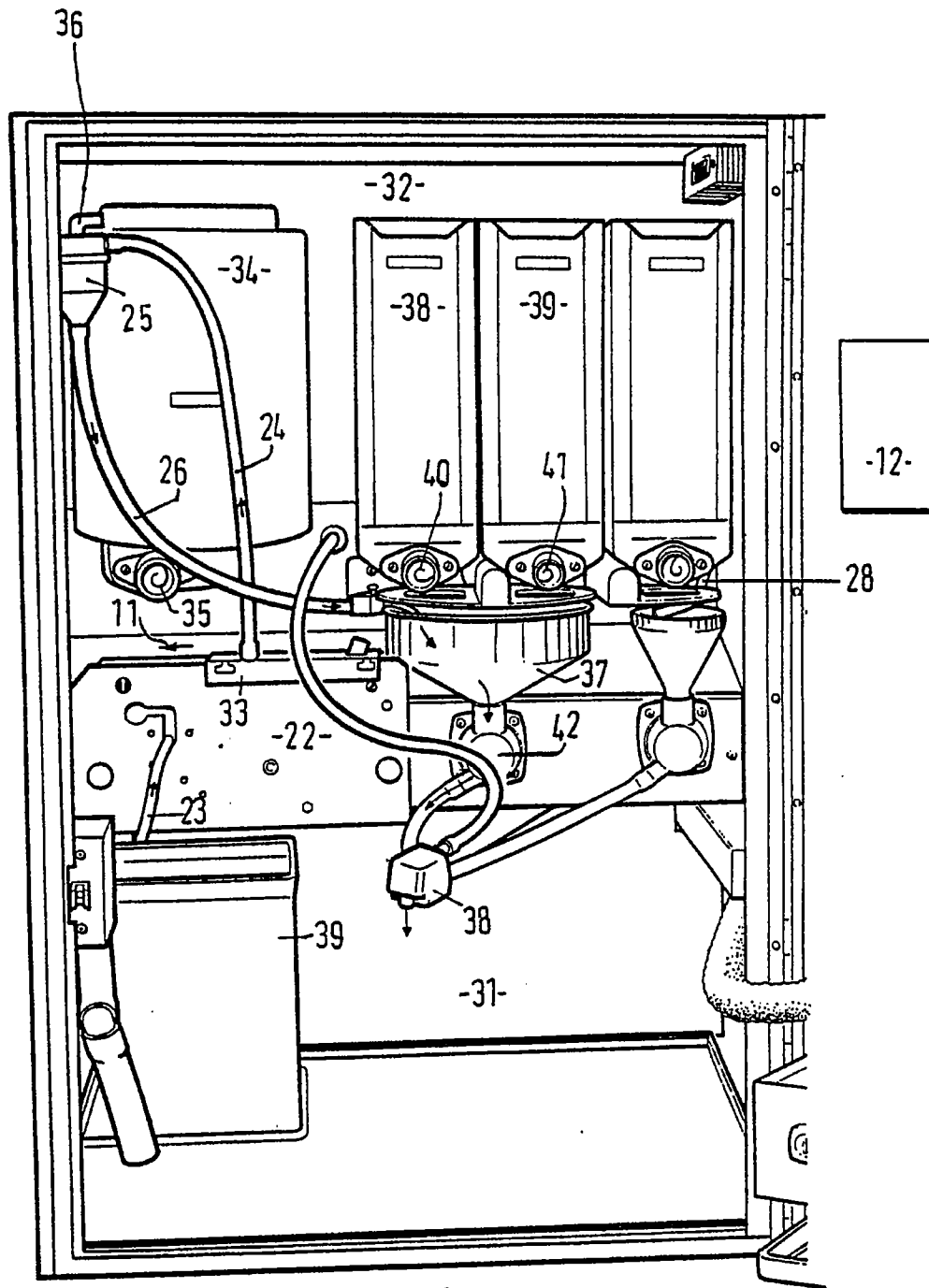


FIG. 2.

3 / 3

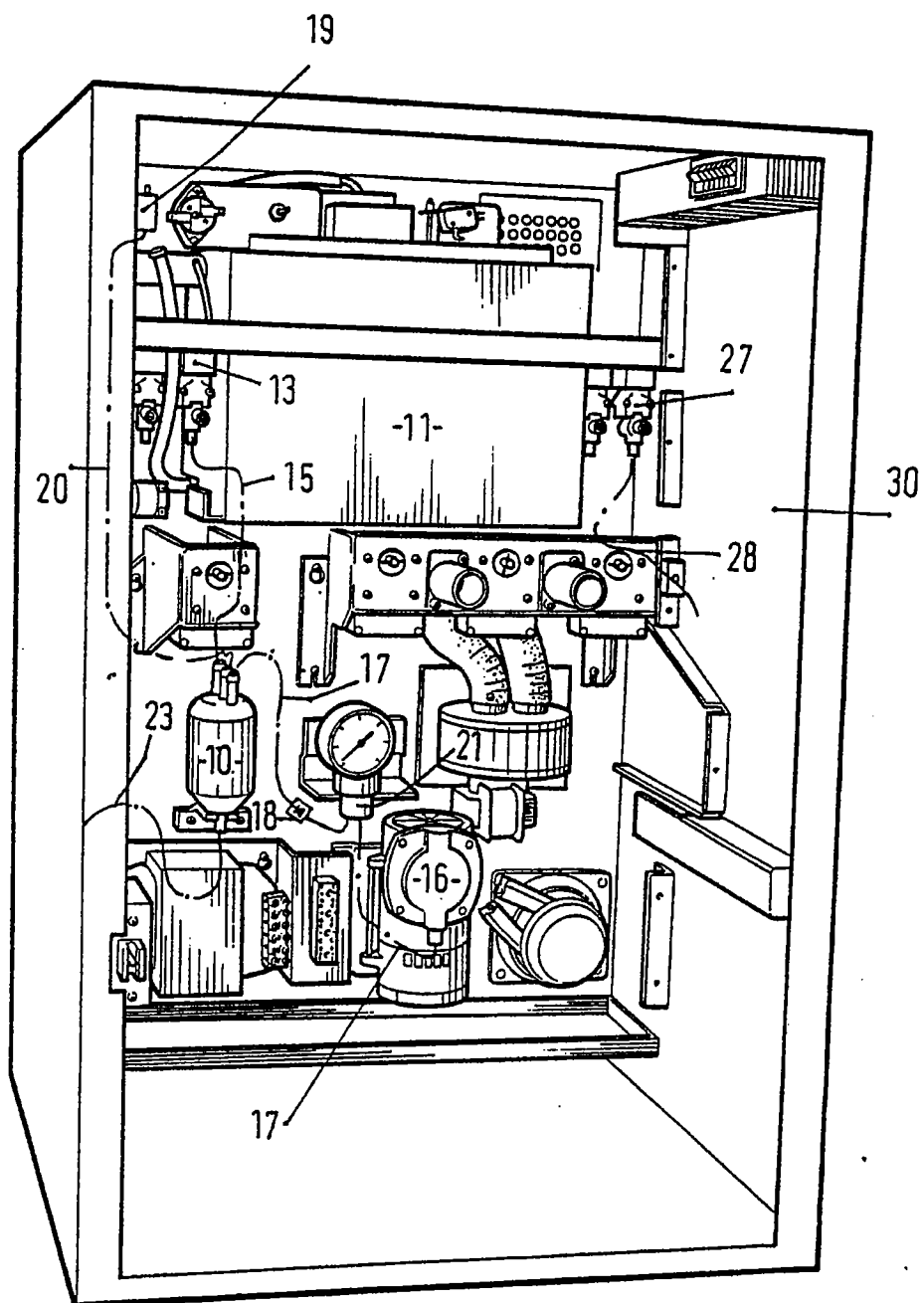
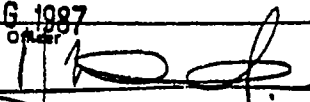


FIG. 3.

# INTERNATIONAL SEARCH REPORT

International Application No PCT/GB 87/00333 -

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (if several classification symbols apply, indicate all) <sup>6</sup>		
According to International Patent Classification (IPC) or to both National Classification and IPC		
IPC <sup>4</sup> : A 47 J 31/32; A 47 J 31/40		
<b>II. FIELDS SEARCHED</b>		
Minimum Documentation Searched <sup>7</sup>		
Classification System	Classification Symbols	
IPC <sup>4</sup>	A 47 J	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched <sup>8</sup>		
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT <sup>9</sup></b>		
Category <sup>9</sup>	Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup>	Relevant to Claim No. <sup>13</sup>
X	US, A, 3446137 (PRYOR et al.) 27 May 1969 see column 3, lines 14,15; figure 1 --	1-5,7-9
A	US, A, 3338153 (HOLSTEIN et al.) 29 August 1967 see the whole document --	1
A	US, A, 4143589 (WEBER) 13 March 1979 see the whole document  -----	1
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<b>IV. CERTIFICATION</b>		
Date of the Actual Completion of the International Search		Date of Mailing of this International Search Report
31st July 1987		21 AUG 1987
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A- 3446137	27/05/69	None	
US-A- 3338153		None	
US-A- 4143589	13/03/79	None	

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